INTEX-NA Flight 15: 2 August 2004

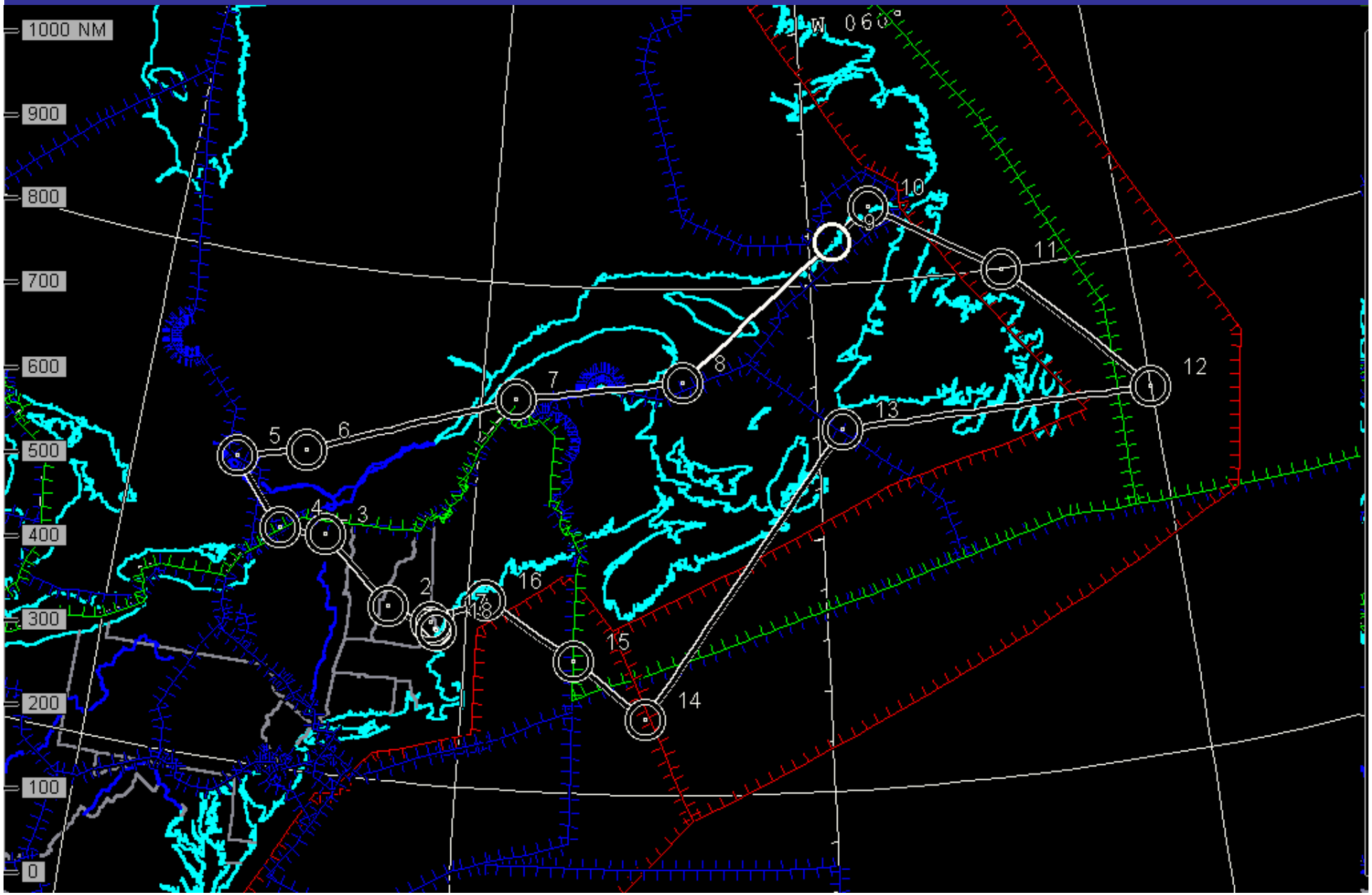
Flight 15 was the seventh DC-8 science flight from Pease. The main objectives were to under-fly Terra (MOPITT/MODIS) and Aqua (AIRS) satellites, sample low level North American outflow and aged air pollution aloft, conduct a coordinated closure experiment over Ron Brown with the J-31, and a flyby over the ground Appledore island air quality station. Takeoff was at 1300 UT with a total flight duration of 9.5 hours. The flight plan and flight profile is shown in the attached slides.

Meteorological conditions were dominated by high pressure. Specifically, the flight headed southeast toward the subtropical (Bermuda) high that at the surface was centered near 35^{o} N, 42^{o} W. This warm core system maintained its identity through 500 mb, but became somewhat diffuse at higher levels. The flight track carried us southwest of the surface center. Seven day back trajectories throughout the troposphere showed re-circulating paths about the center, with some inflow from the northwest and also from the Caribbean. The second major surface feature was a weak cold front that was advancing toward the Pease area from the west. It was associated with a short wave trough aloft. There was little cloud cover during the flight, mainly because the track extended into the subtropical high where subsiding air dominates. The satellite underpass point was virtually cloud free at all altitudes, and the inter-comparison point with the P-3 had only broken cirrus, but almost no clouds in the mid and lower levels. This cirrus was associated with the advancing cold frontal system.

Immediately after take off in the northwesterly direction we encountered pollution at 20000 ft where O3 and CO mixing ratios exceeded 90 ppb and 250 ppb respectively. Descent to surface level measured typical boundary layer conditions with moderately elevated levels (O3-50 ppb; CO-165 ppb; SO2- 1 ppb; HCHO- 2 ppb). Ascent to 33000ft encountered several pollution layers at low (10-15000 ft) and high (25-33000 ft) levels with somewhat different characteristics. O3 levels between 25-33000 ft often exceeded 100 ppb with elevated CO levels. In all these polluted layers large numbers of small (20-30 nm) nonvolatile particles were nearly always present. This thick layer of pollution continued to persist along the northern and eastern flight track and O3 concentrations as high as 130 ppb were observed. Compared to upper level pollution the boundary layer was relatively clean. These upper-level air masses appeared aged and may have been Asian in origin. At 1620 UT we did a successful under-flight (30000 to 500 ft) within the Aqua and Terra swaths under extremely clear conditions. Biomass burning influences were evident (high HCN) in pollution layers present 6-15000 ft. We crossed the jet core at our northerly leg and sampled the lower stratosphere (O3- 360 ppb; CO- 45). Unusually high concentrations of HNO4 (100 ppt) were frequently encountered in the upper troposphere. In the North American outflow region (easterly leg) we sampled the lowest trroposphere but found only moderate concentrations of CO (160 ppb) and O3 (45 ppb). The upper level pollution continued to persist with CO and O3 levels exceeding 160 ppb and 130 ppb. At 21:40 UT we spiraled down over the Ron Brown under clear conditions while J-31 spiraled up in a successful coordinated experiment to relate aerosol microphysics and radiative properties. The DC-8 did a flyby over the Appledore island station before returning to Pease. In general all models tended to under-predict O3 and over predict CO by fairly significant amounts.

The navigational data are available at URL: http://www.dfrc.nasa.gov/Research/AirSci/DC-8/ICATS/index.html

INTEX-NASA 817 2 Aug 04



DC-8 NASA 817 INTEX 02 Aug 04

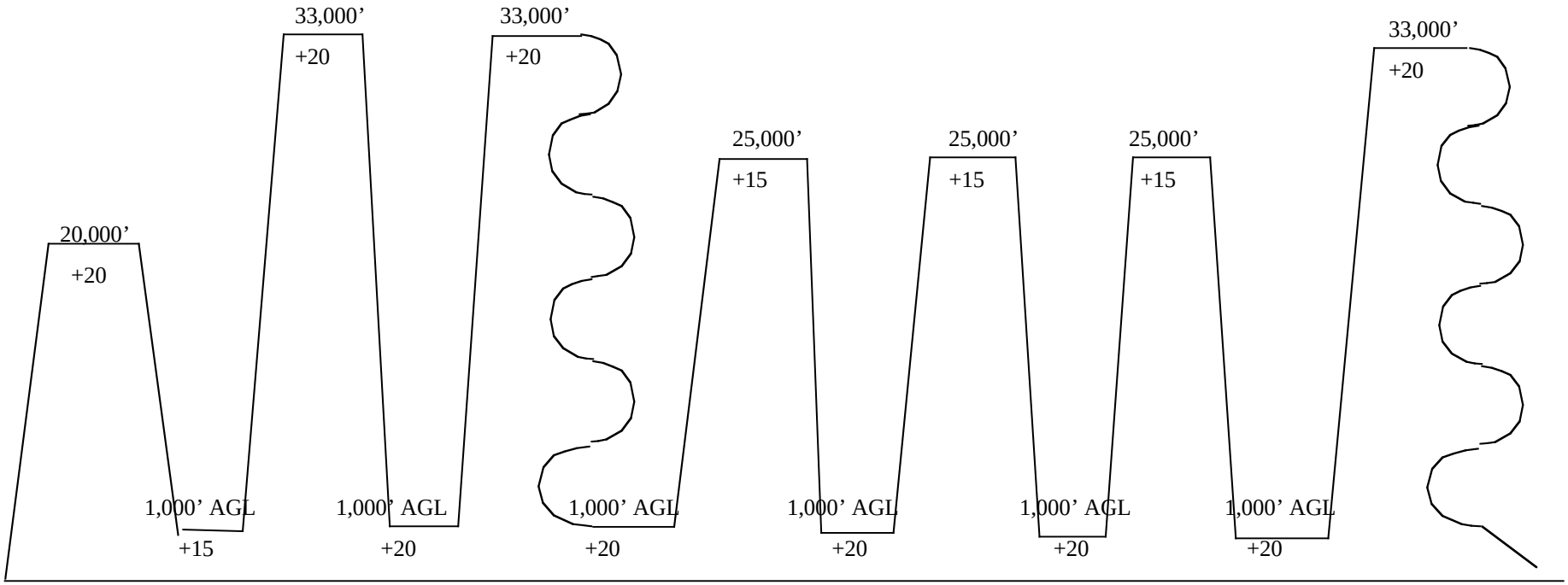
SPIRAL CLIMBS

to 10,000 msl @1,000 fpm

then 1500 fpm

ALL ENROUTE CLIMBS/DESCENTS

1500 FPM



PSM PT3 PT7 GASPE PT 9 PT11 PT13 PT14 PT16 PSM

TYPE ACFT	CALL SIGN	DATE	FROM	TO	PLND TO	ACT TO	PILOT	COPILOT
DC-8	NASA817		PEASE INTL TR N 43 05.5 W070 50.0	PEASE INTL TR N 43 04.7 W070 49.4	13:06.2			

TOT DIST	TOT TIME	FUEL REQ	NAVIGATOR	ENGINEER
2725.5	09+35.4	87332		

TP DTD#	Fix/Point Description	FREQ	Latitude Longitude	Alt Wind	TAS GS	TC MC	LEG DIST DIST REM	LEG TIME TIME REM	ETA	RETA	ATA	REMARKS
1	KPSM 16 16/R PEASE INTL TR		N 43 05.5 W070 50.0	94M		149 165	5.0 2720	00+03.0 09+32	13:06			
2	RUMMY/W RUMMY		N 43 28.7 W072 10.6	20000M	330 330	294 310	67.3 2653	00+12.1 09+20	13:21			
3	BUGSY/W BUGSY		N 44 43.4 W074 08.5	20000M	330 330	311 327	113.1 2540	00+20.6 09+00	13:41			
4	UMEXO/W UMEXO		N 44 44.3 W075 28.6	20000M	330 330	271 285	57.1 2483	00+10.4 08+49	13:52			
5	YWA/N074013 PETAWAWA	516.00	N 46 00.0 W077 00.0	20000M	330 330	320 333	99.4 2384	00+18.1 08+31	14:10			
6	YMX/E331037 MIRABEL	114X 116.70	N 46 20.0 W075 00.0	20000M	330 330	077 091	85.8 2298	00+15.6 08+16	14:25			
7	CEFOU/W CEFOU		N 47 44.2 W069 00.0	20000M	330 330	071 088	260.2 2038	00+47.3 07+28	15:13			
8	YGP/E178039 GASPE	101X 115.40	N 48 10.0 W064 00.0	20000M	330 330	083 103	203.3 1834	00+37.0 06+51	15:50			
9	PIKNA/W PIKNA		N 50 52.0 W059 15.0	20000M	330 330	049 071	246.5 1588	00+44.8 06+07	16:35			
	.delay		N 50 52.0 W059 15.0	20000M	330 330	049 072	0.0 1588	00+35.0 05+32	17:10			
10	YAY/E301072 ST. ANTHONY N	084X 113.70	N 51 30.0 W058 00.0	20000M	330 330	051 074	60.6 1527	00+11.0 05+21	17:21			
11	YQX/R042069 GANDER	074X 112.70	N 50 00.0 W054 00.0	20000M	330 330	121 143	177.0 1350	00+32.2 04+48	17:53			
12	UYT/T124114 ST. JOHN'S	023X	N 47 15.0 W050 00.0	20000M	330 330	136 157	229.3 1121	00+41.7 04+07	18:34			
13	BRIDG/W BRIDG		N 47 08.8 W059 16.3	20000M	330 330	269 290	379.2 742	01+08.9 02+58	19:43			

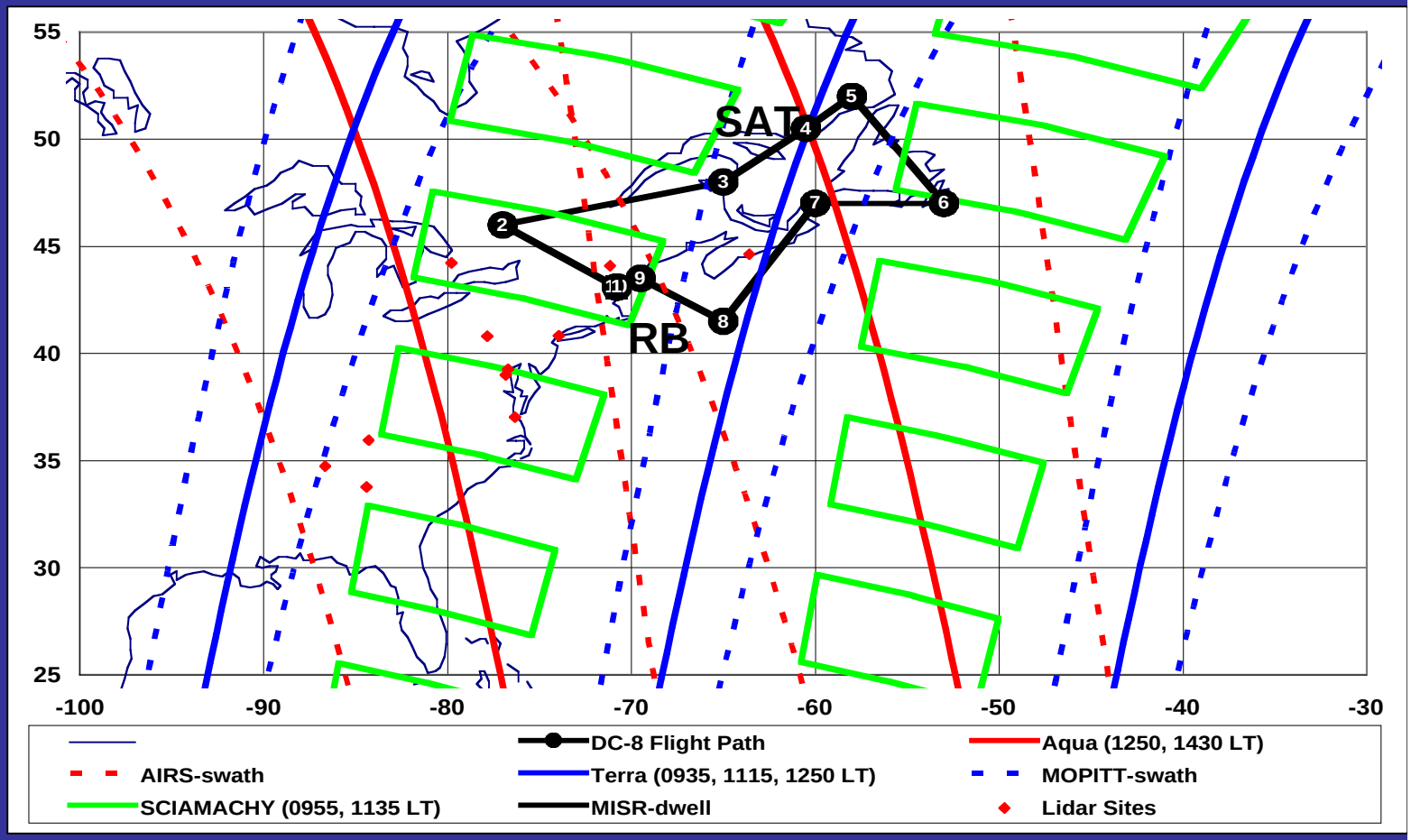
TP	Fix/Point	FREQ	Latitude	Alt	TAS	TC	LEG DIST	LEG TIME	ETA	RETA	ATA	REMARKS

DTD#	Description		Longitude	Wind	GS	MC	DIST REM	TIME REM				
14	SCI PT		N 41 30.0 W065 00.0	20000M	330 330	216 235	418.9 323	01+16.2 01+42	20:60			
15	KANNI/W KANNI		N 42 38.0 W067 00.0	20000M	330 330	307 325	112.3 211	00+20.4 01+21	21:20			
16	.RON BROWN		N 43 45.0 W069 30.0	20000M	330 330	301 319	120.6 82	00+23.4 +58	21:43			
	.delay		N 43 45.0 W069 30.0	20000M	330 330	301 318	0.0 82	00+35.0 +23	22:18			
17	EPDEY/W EPDEY		N 43 14.5 W070 57.5	20000M	330 330	244 261	70.6 11	00+12.8 +10	22:31			
18	KPSM/A PEASE INTL TR		N 43 04.7 W070 49.4	100M		149 165	11.5 0	00+10.0 +00	22:41			

INTEX Flight #15 Plan – Pease Local #6 August 2, 2004

Take off: 0900

Flight time: 9 h



Objectives: Layered influences: Anthro, Biomass, Asian (leg 1-5)

Aqua/Terra underflight (point 3-4)- 1200 LT

Transition from polluted (leg 6-7) to cleaner conditions (leg 7-8)

Spiral over Ron Brown with J-31 (point 9)